Unesco's

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GRAPHIC COMMUNICATIONS

Project Idea -
A Feasibility Study

Indian Report

1982

National Council of Educational Research & Training
Regional College of Education

Ajmer, Rajasthan

INDIA

FOREWORD

It is well known that Technical Drawing is increasingly used in developing countries for communication. In future, the need for more and more use of technical drawing would be felt by the society. It is in the fitness of things, therefore, that UNESCO took up this aspect and prepared a course of Graphic Communications for grade VII, VIII and IX. The Course consists of the following materials :-

1. Teacher's Guide
2. Background Paper 'Info TVE 6 '.
3. Student's Workbooks A1 to A6, B1 to B6 and C1 to C6.

As desired by UNESCO the Graphic Communications Course was experimented in INDIA on a preliminary scale by the NCERT, New Delhi. Regional College of Education, Ajmer, a constituent unit of the NCERT, carried out the Course A1 to A6 as a feasibility study at Ajmer. The course material was tried out in an average secondary school of Ajmer by Dr. Tej Bahadur Mathur as Research Investigator.

It is hoped that the report would be of interest to UNESCO as a feed-back for further development of this course material. I am thankful to UNESCO for giving the benefit of their Graphic Communications Course to Indian Students.

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December 15, 1982.

PREFACE

No education is complete without giving the ability to the child to express himself in language(both spoken & written)and through graphics. In the future society there would be tremendous growth of technology and every person would use various types of technical equipments.Technical drawing would be increasingly used for the manufacture, use and repair of technical equipments. Indeed,Unesco's Revised Recommendation concerning Technical and Vocational Education,1974, para 22(e), mentioned that 'the ability to communicate by graphical means should be developed in all children'.

As a consequence to the recommendation Unesco's Section of Technical and Vocational Education,7 Place de Fontenoy, 75700 Paris published a series of twelve papers (Up to October 1980) and also developed eighteen units of Graphic Communications. These units were conceived as individualised learning materials for boys and girls (average age 12-15)in grades 7 to 9. The units were designed for international use to develop skills in graphic communications as an integral part of general education.

National Council of Educational Research and Training(NCERT), New Delhi(India) got interested in the programme of Graphic Communications. It was decided that the first six Units (A1 to A6) of the Graphic Communications should be tried out by Regional College of Education,Ajmer. The actual work of teaching Graphic Communications through the use of UNESCO's six students Workbooks was done from August 1982 to November 1982. Earlier, the students Workbooks were translated and modified for use under Indian condition. Forty-two boys of class VIII of Govt.Jawahar Higher Secondary School, Ajmer were involved in the study with one of their school teachers as a guide. The material was supplied to the teacher and the school by the investigator. The procedures outlined by Unesco for working of the project were followed. In evaluation and feedback given to the students, the investigator tried to maintain objectivity.

A brief research report is presented in the following seven chapters. Methodology followed in the study is presented in Chapter Three. Observations and experiences during teaching of the course through six students workbooks are described in Chapter Four. An analysis of the workbooks is placed in Chapter Five. Conclusions drawn on the bases of the aforesaid may be read in

Chapter Six, which is followed by Suggestions for Future. It is hoped that the study will be of interest to those who want to teach Graphic Communications.

The investigator is grateful to Shri Mohan Singh and Shri M.P.Kaushik of Government Jawahar Higher Secondary School, Ajmer for giving him unstinted support in carrying the study. Dr.M.M.Chaudhary, Professor and Head, Department of Teaching Aids, NCERT, assisted him in formulating the report. The investigator is grateful to him. Dr.S.N.Dutta, Principal, Regional College of Education, Ajmer not only provided facilities for the investigation but gave moral support and inspiration. The investigator is indebted to him.

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CONTENT

Foreword- Dr.S.N.Dutta, Principal

Preface- Dr.Tej Bahadur Mathur

Chapter I- Introduction 1-7

Chapter II- Objectives 8-11

Chapter III- Methodology 12-20

Chapter IV- Experiences During Teaching of the Course. 21-24

Chapter V- Analysis of the Workbooks 25-43

Chapter VI- Conclusions. 44-45

Chapter VII- Suggestions For Future. 46-49

ANNESURE 50

A- List of Organisations and Persons Involved. 51-52

B- Concluding Function 53-55

C- Book References. 56-57

D- Names of Students and Group Leaders. 58-60

E- Three Photographs. 61-63

F- Questionnaire on Graphic Communications Course. 64-65

G- List of Visual Materials Used. 66-69

CHAPTER I

INTRODUCTION

1.1. Background:

In everyday life we need to draw some diagrams or maps to effectively communicate our ideas to other persons. In future, the need to draw such illustrative diagrams would increase in the developing countries where technology is gaining momentum. In newspapers, on the road corners, books and magazines we find illustrations. There is need to read and understand the communication through graphics.

1.2. UNESCO PROJECT:

UNESCO prepared a Background Paper Info TVE 6 and Teacher's Guide on graphic communications. Along with this, Students Work Books UNITS A-1 to A-6, Units B-1 to B-6 and Units C-1 to C-6 were prepared. These materials were prepared for use of the students of grade-7, grade-8 and grade-9. The aims of this course are :

i) to enable the students to express themselves graphically, and

ii) to enable the students to read and work with technical and non-technical graphic materials.

1.3. UNESCO's Objectives:

UNESCO offered this course to its member States for the following reasons : (See para 8 of Unesco's Info TVE 6)

a) to promote better communication between different groups of people and cultures by the universally understood language of graphics. The course is based on the international standards of ISO and the metric systems and the material has been prepared for easy adaptation to the particular needs of a Member State.

b) to encourage self-motivated learning habits by use of a unit system of self-learning packages. This is one of the goals of life long education and these methods may also be applicable to other fields in education.

c) to promote integration of technical and vocational education into general education.

d) to encourage local production and adaptation of learning materials. UNESCO does not intend to publish this material but a copyright will be granted to all MEMBER STATES on request.

1.4. Need in Indian Context:-

India is fast advancing in technology and science. In the future society of India, there would be need to use technical drawings for the purposes of communication. It is in the fitness of things that attention is drawn of the Indian Educationists and Educators to provide opportunity to students in the age group 12-15 years

for learning graphic communication. This means that students of India would be able to draw simple sketches of common use. They will also learn to draw sketches of objects, machines, houses, cars etc. alongwith its dimensions. Besides this, they will be given opportunity to read correctly road maps, railway maps and other graphics. The skill of drawing sketches and simple maps is also to be learnt by the students of the present generation.

It is noteworthy that UNESCO has done a great service to Indian educators by preparing the experimental material on graphic communications. Having fully realised the usefulness of the technican drawing course for general education, the material prepared by UNESCO on graphic communications was given a trial in India. National Council of Educational Research and Training took up this project and it was assigned to Regional College of Education, Ajmer in the State of Rajasthan.

1.5. Key Questions:

UNESCO prepared its course on graphic communication on the basis of the following recommendations made in several International Expert meetings (See page 3 of Background paper)

a) technical drawing should be emphasised because it is the language of technology and it should be a universal language;

b) the cost of establishing technical drawing courses is minimal - no expensive workshops and equipments are necessary;

c) technical drawing courses appropriate for general schools should be developed;

d) technical drawing should be given in grades seven to nine for two or three periods per week. At the levels of diversification, greater time allocations should be made;

e) teachers should be specially trained in technical drawing and the methods of teaching the subject; and

f) suitable teaching material should be developed; visual aids are specially useful in this area.

1.6. Curriculum Relevance :

Drawing has been a compulsory subject for many years in India. In some States drawing still continues to be a compulsory subject in elementary classes (Class I to VI). In Secondary classes drawing has been replaced by other subjects. In some States drawing is optional in classes VI to X but the emphasis is mainly directed to the development of aesthetic qualities in the students. Technican drawing is not taught to the students at any stage neither at elementary nor at the secondary level.

The present generation of students are being prepared for the year 2000 and onwards. In the fast technological development, technical drawing is considered a useful subject of the curriculum. It is interesting to note that the course on graphic communication prepared by UNESCO is offered as a part of curriculum of general education for the students of grade VII to grade IX.

1.7. Significance and National Relevance:

Many people, well educated, are generally illiterate in regard to their reading of maps and technical drawing. They are unable to express themselves by means of sketches and graphics. They communicate with each other through language but for many things, the use of graphics is more effective than the use of words. There is a famous saying that "A picture is worth a thousand words". The teacher is taught to use more and more of graphics in communicating his ideas to the students. The curriculum of teacher education gives importance to graphics. However, as a part of general education, graphic communication - hardly finds a place. The following maxims have yet to be picked up and understood and fully realised by the people in India.

i) Graphic literacy is an essential skill for students.

ii) Technical Drawing is the universal language of technology.

iii) Continuous practice leads to proficiency in skill development.

iv) Self-evaluation is a vehicle of responsible growth.

1.8. Contribution which the Study is Expected to make to Theory and Methodology:

The present study is a feasibility study of the programme of graphic communications developed by UNESCO. The theory and methodology of teaching-learning graphic communications is spelled out by UNESCO on the basis of experiences of technical experts connected with graphic communications. The Indian investigators got interested in this programme and devised teaching strategy to teach graphic communications to students of class VIII (grade VIII) of a typical Indian school. Unit A-1 to A-6 was translated into local language (HINDI also national language) and was used alongwith the classroom teaching. The students workbooks were not only translated but were also adapted to the local conditions and modifications were made where-ever

found necessary. Some additional exercises were added to the students workbook. It is expected that the present study would throw light on theoretical aspects of the course. It may also point out the methodology which can be used effectively for this course. This report deals with the tryout of the Unesco graphic communications course in the Indian School.

CHAPTER - 2

OBJECTIVES.

2.1. Objectives Outlined by UNESCO.

Graphic communications courses should be incorporated as an integral part of the general education in schools. The content of these courses should be designed in close relation to the content of courses in general technical theory and workshop practices. The students should not only observe an object but should also learn to sketch the object. It was visualised that the workbooks unit A-1 to A-6 would be completed in approximately thirty periods in grade VII. This will cover basics of drawing, basic free hand sketching, basics of orthographic drawing, basics of pictorial drawing, measurement and dimensioning and maps and lay outs. It was also visualised that technical drawing can only be learned by actual drawing and sketching. It required an active participation by student learners. It was expected that the teacher would devise his own innovative teaching methods. Further, it was suggested that the teacher would make use of locally produced models and teaching aids.

The units of the course were conceived as self-learning packages to enable each learner to progress at his own pace. UNESCO expected that these units could also be suitably used in the traditional class room situation as teacher-assisted learning material. Each student workbook was planned in such a way that it provided motivation, information, application and evaluation. Each Unit provides a statement of behavioural objectives which the learner is expected to achieve by completing the units. In each unit self test and unit test are provided in such a way that the student learner may be able to assess his progress. UNESCO suggested that the units prepared by them, could be tried out at Curriculum Development Centre or in a technical teacher training institution. A certain research activity is involved in trying out this material. UNESCO expected to get the feedback of information from a country willing to take it up in order to improve the material. A questionnaire was also prepared for this purpose(see Annexure F). UNESCO purposely devised this course so as to encourage other countries to produce such type of material in line with the course material(units)developed by it.

2.2. Learner Objectives.

The project was tried out in a school keeping in view the following learner objectives:-

a) to develop the ability to express ideas and describe objects by means of drawing.

b) to interpret norms and symbols used in technical drawing.

c) to develop lettering skills in free hand lettering and sketching.

d) to understand and read simple drawings, blue prints and diagrams.

e) to appreciate quality in workmanship and neatness in production ; and

f) to develop accuracy and the ability to think visually.

2.3. Project Objectives:

The project objectives were drawn from the objectives outlined by UNESCO and learner objectives. A few research questions were posed for the present study. The project objectives are as follows:-

a) to translate in local language(Hindi) the six units of A-1 to A-6 prepared by UNESCO.

b) to modify and adapt the various exercises of the six units.

c) to realise the objectives of teaching graphic communications to students as enunciated in students workbooks,

d) to suggest improvements in the six units (A-1 to A-6) on the basis of working with the students in India.

e) to get the drawing and sketch work of the students evaluated and provide feedback to UNESCO.

f) to find out the efficacy of the court for Indian children.

g) to assess the utility of the self learning device in terms of workbooks for learning graphic communication.

h) to assess the motivation of students in regard to learning graphic communications based on suitable record, and

i) to offer suggestions based on the study for its future use in India and abroad.

CHAPTER 3

METHODOLOGY

3.1. Try Out :

The project was taken up in mid December 1981. The Investigator oriented the school teacher of D.M.P.H.S. School, Ajmer regarding the objectives of the project. Besides giving the literature he oriented the school teacher with the techniques of teaching. The school teacher tried out the unit A-1 on 25 students of class VII of the said school. It was found that the students of class VII could not follow and learn as visualised in the Graphic Communications project. The Chief Investigator also observed the classroom teaching and he was also convinced that the project should be tried out in class VIII instead of class VII. Thus, Unit A-1 was tried out on 25 students of class VIII of DMPHS, School, Ajmer. As this school has English medium sections. the students could understand the language(partly)of the Students' Workbook Unit A1. The try out was useful as it revealed the initial difficulties which had to be overcome for smooth running of the project. This related to instrument box, pencil, eraser, drawing sheets and related material as well as with the problem of seating

arrangement of students in the classroom. (The classrooms in India are generally over-crowded and the desks are so much close to each other that there is not enough space needed for drawing work). Moreover, the use of drawing board and 'T' was required in the project. The try out was completed by the middle of February 1982.

3.2. Institution Location :

After the initial try out a suitable school was needed where facilities could be obtained for carrying out the project. The biggest difficulty was that drawing is not a part and parcel of the curriculum of class VIII (grade VIII) of schools in Ajmer, Rajasthan. This meant providing special time in the time-table of the class for carrying out the project. In addition to this, a teacher of drawing was needed who must be on the staff of the school where the project was to be located. The Headmaster had also to agree to provide time, staff and facilities for the running of the project. Government Jawahar Higher Secondary School, Ajmer, located centrally, was selected for the working of the project. The Headmaster agreed to provide facilities and a teacher of the school readily agreed to work out the project

by giving extra time to the boys for teaching graphic communications. As the project required support from the District Education Officer, the College approached the concerned officer and got his approval.

3.3. Modification of Workbook:

The Unesco Programme provided only six students Workbooks for the project. 42 students' workbooks of each unit were required for individual use in the classroom. It was stipulated by Unesco that the students workbook would be translated into the local language by the user country and got duplicated. The local adaptation and modification of students' workbook Unit A-1 to A-6 was taken up and after getting the workbooks translated into local language (HINDI), the students' workbooks were got duplicated by photostat process.

3.3.1. Translation:

The students' workbook Unit A-1 was first translated and utilised. Later, students' workbook Unit A-2 was taken up for translation while Unit A-1 was being used for the project. All the six students' workbooks were similarly translated and modified for local use. In translating the students' workbook, technical words were translated as done by Government

of India in their recognised dictionary. In some cases, English words were used because they were more familiar and easier for the students to comprehend. Discussions were held with experts of the language while translating the workbooks. This was slightly difficult in view of the technical nature of graphic communications.

3.3.2. Visual Modification:

The students' workbook could have been re-drafted and drawings done by Indian artists. This would have taken lot of expenditure and time. It was, therefore, decided to keep intact the drawings of the original students' workbook supplied by UNESCO.

3.4. Preparation of Teaching Aids:

Graphic communications is unknown as a subject of studies for students of secondary schools in India. It was a difficult job to acquaint the students with the basics of graphic communications without the use of suitable teaching aids, namely; charts, models, graphs. etc. During the try out, it was understood that teaching aids would be needed in addition to the workbooks for making the students understand the various concepts, learning various skills of drawing and comprehending isometric

drawing, multiview drawing, Layouts of maps, reading scales on the maps, etc. Graphic aids on drawing sheets (black & white or coloured) were got prepared in advance for use alongwith the workbook and classroom teaching. The following charts or maps and models provided a view of the teaching aids prepared and used for the project :-

Unit A1	6 charts or maps.	2 models
Unit A2	7 "	5 "
Unit A3	9 "	2 "
Unit A4	11 "	4 "
Unit A5	10 "	2 "
Unit A6	8 "	Nil
TOTAL:	51 "	15 "

3.5. Teacher Orientation:

The school provided a teacher who had basic understanding of drawing and who was responsible for teaching drawing in classes VI to VIII of the school. The teacher was made acquainted with the aims and objectives of the project. The project envisaged motivation, information, application and evaluation. It was stressed that if the objectives of each UNIT was explained

well to the students, they could be better prepared to work on the students workbook. This was a ticklish job for the teacher. This required giving a lot of information and inspiration to the students. In India, motivation is provided more by way of affective domain. This was to be done properly by the teacher concerned. In addition to this, the teacher was involved in modification and adaptation of the students' workbook. The project envisaged giving freedom to the teacher in following his own best method for making the students understand and learn drawing as a psychomotor skill. The teacher was also instructed to use group leaders in providing assistance to students who were weak in drawing. The teacher was given Background paper Info TVE 6 and the Teachers' Guide. The procedure of working was also explained to him.

3.6. Supply of Material to the School:

Since drawing is not a subject for all the secondary students in the Indian schools, the teacher was supplied with the following material:-

1. Drawing Board with 'T' set	2
2. Roll up boards of rubber	2
3. Big size instrument box consisting of two triangles, a scale, one protractor, one divider and one compass	2 sets
4. Cardboard sheets	40 sheets
5. Coloured papers	80 sheets
6. Drawing pins	2 sets
7. Scissors	4
8. Gum tubes	4
9. Coloured Cut papers of chairs, tables, sofa set, double bed, dining table etc.	45 sets
10. Big size tourist map of Rajasthan	1
11. Big size map of Ajmer town and its suburbs	1
12. Instrument Boxes	45 sets
13. HB and 2H pencils	45 sets
14. Eraser	45 pieces
15. Cartons of various sizes for use as models	10
16. Set of wooden block cubes	1
17. Display board for use in classroom	2
18. Artist made teaching aids for Unit A-1 to A-6	51 charts
19. Railway Time-table	4 books

3.7. Teaching:

The school had provision of 30 minutes period. It was stipulated to complete the project work from mid August to mid November, 1982. Due to shortage of time students were called on Sundays as well when two periods were organised. Interestingly the students gladly came on Sundays. Thus the project was completed in 78 periods of 30 minutes each, i.e. about 39 hours. The teaching commenced on 19.8.82 and completed on 11.11.1982.

3.7.1. Teacher's Innovation:

The teacher got interested in the project as it proceeded. The response from the students was enthusiastic. They got keenly interested in learning graphic communications. The students workbooks were never given for home completion. ONLY in the classroom conditions of an average Indian school, the project was carried out. The teacher was encouraged to devise his own method for effective learning on the part of the students. The following procedures were adopted for effective functioning:-

a) The cover page of the students' workbooks were coloured (four colours) on the top right hand side corner. Each student belonging to one group had his colour, name and group number mentioned at the top of the front page of the students workbook. (Details in Annexure D).

b) The card board cartons used for placing instrument box for different groups were also coloured on all the four sides with four different colours of each group. Group Leader carried the card Board cartons with him to the classroom and distributed the instruments to the students of=his group.

c) Class monitor was made responsible for collecting the materials from the group leaders and placing it in the cupboard provided by the school.

3.7.2. Classroom Teaching:

In order to make the students learn, the students' workbooks were given to each student in the classroom but because of language difficulty, the teacher had to direct the students at every stage to go from one unit to another alongwith the visual aids.

CHAPTER 4.

EXPERIENCES DURING TEACHING OF THE COURSE

4.1. CHANGES IN STUDENTS WORKBOOK:

Six workbooks provided in the project were used in actual classroom situation. In India the class work is mostly guided by teacher's suggestions and teacher explaining to the students. Frequent use of black board and teacher statements are noteworthy features of class room teaching. The teacher has to inspire the students for learning. The continued interest in learning on the part of students depend mostly upon the activities and the personality of the teacher. Since motivation from the parents is lacking, the teacher's responsibility for continuous guidance and motivation is essential. As regards the graphic communications course, it was accepted as a project by the teacher and headmaster of the school. The parents were not involved. The students had no interest for additional learning as this was not a part and parcel of their curriculum and examination. Mostly the students are guided by school "Pass and Fail". They lack interest in learning additional things not related to their course. Under this background the project had to be

carried out. The teacher who took the project was shaky in the beginning since he was not sure of the cooperation he would be getting from the students but as the project continued and the workbooks were continuously used, the students got gradually involved into it. They picked up interest on their own and with their interest the teacher's confidence grew and his performance improved. The changes in work books were made gradually and not in the beginning of the project. The teacher (actually teaching in classroom) was involved in preparing additional exercises for different units. The modifications and changes made in the various exercises are given in detail in Chapter V.

4.2. A.V.Material Developed:

Under the scheme of the project some visual material in the shape of charts, diagrams were got prepared in advance. Some of the illustrations were taken from the work books. The teacher used them in the classroom and explained the details with a pointer. The students were later asked to do the exercises in their own work book. Similarly models were shown and

the teacher made use of black-board to draw the models. Sometimes the teacher brought in advance diagrams drawn on the roller board. Local devices were also used for making difficult points clear to the boys. Card board cartons were collected and given to the teachers for use in units A-2, A-3, A-4 and A-5. This provided spatial understanding to the students. The students were also required to use match boxes for understanding the various sketches that they were required to draw in the work book. Each group leader was given models (suggested by UNESCO Teacher's Guide) for play. This created greater interest among the students for learning graphic communications. Students in India are not generally exposed to such work books except to certain extent in languages. Thus the motivation for the students to learn graphic communications increased as the course was gradually covered (a list of visual materials used is in Annexure G).

4.3. Motivation of the students :

A continuous record was maintained by the chief investigator for each of the students of the project. This was done through evaluation of the

work done on students work book, general observation in the class room while the teacher was teaching and attendance of the students on Sundays which were made working days for the project. The work-books were evaluated by chief investigator and the teacher almost every day. The record revealed the picking up of interest by the students. The remarks of the evaluator did have the pronounced effect on the students. The remarks given were 'Good','Very Good', 'Well Done','You are doing better','Your work is Improving','Do better next time' etc.

The interest of the students in picking up graphic communications was observed by the chief investigator who found that the teacher's motivation played a pre-dominent role in creating motivation among the students. The teacher was affectionate and kind and always provided encouragement to the boys. He never disheartened even the weakest boy of the class(in terms of achievement). Classes were held on Sundays falling on August 22,29, September 5,12,19, October 3,10,17 and 24 and November 7,1982. This was done to complete the course by middle of November 1982.

CHAPTER 5

ANALYSIS OF THE WORKBOOKS

5.1. [illegible] Scheme of Analysis,

The students workbooks were analysed on the following criteria.

A. Errors found in workbook.

B. Difficulties in teaching, adaptation and supply of teaching aids.

C. Suggestions for Improvement.

5.2. PART-I- Unit A-1.

A. Errors Found in Workbook.

i) Use of protractor is not taught to the students in this unit while it was expected that students would use protractor to draw 75° angle in exercise No.12(page-14).

ii) In unit test No.1 (page 17)F.Dimensions are given but it was not taught earlier in the unit except that it was mentioned as NUMBERS on page 2 item No.3.

B. Difficulties in teaching, adaptation and supply of teaching aids.

i) RASTER given in the workbook(after page 5) is not used generally in India and it was found redundant.

C. Suggestions for Improvement.

i) From exercise No. 7 to exercise No. 8(Page 10) one repetitive easier exercise may be included so as to make learning easier and effective.

ii)Exercise No.11 & Exercise No.12(Page-14)

The students have to be informed clearly that the short lines(on the base of rectangle)given in the two exercises are not actually lines but are indicative of dots. The students are required to draw various angles by the use of protractor and triangles.

5.3. Part -II- Unit A-2.

A. Errors Found in Workbook.

In exercise No. 8(page 8)the points given are not properly placed and hence lines could not be drawn as visualised.

B. Difficulties in teaching,adaptation and supply of teaching aids.

In exercise No.14 to 21 sketches had to be drawn. The pictorial sketches drawn by the students were not upto the mark. This was due to lack of spatial understanding of the students. The teacher had difficulties in teaching these exercises and the

students faced difficulties in drawing sketches. If the teacher had used match boxes as models, the students would have done better on these exercises. Each student should make use of match boxes for sketching these exercises.

C. Suggestions for Improvement.

i) Exercise No.12(page-11) was found very interesting as the aeroplane is of great interest to the boys.

ii) In Exercise No. 13(page 12) the instruments drawn by the students were generally correct because they are well known in India and are seen by the students almost every day.

iii) In the self test (page-13) exercise No. 2 was found slightly difficult by most of the students.

iv) In exercise No. 14 and 15(page-14), it is suggested that dots may be provided on the right hand side as help in drawing sketches.

v) In exercises No. 16 to 18, models of match boxes should invariably be used for teaching. The students may use the models in groups or individually.

vi) Exercises No.19 to 21(page 16)-For Indian students these exercises are very difficult. If the teacher provides facilities for using match boxes, the sketches could be drawn and understood better.

vii) Exercises No. 22 to 24(page 17) Exercises No. 22 and 23 were done fairly well by the students. Exercise No. 24 was slightly difficult for the students.

viii) Exercise 25 to 27(page 18)-Exercise No.25 was difficult and most of the students could not draw the waste paper basket. In exercise No.26 glass tumblers were generally drawn but the students were not given the idea of ellipse in the workbook.

ix) Unit test (page 19)- In units No.2 and 3 space provided is less for drawing the sketch of motor car or the model.

x) Unit test (Page 20)- Unit test 4 was found more difficult. 70% of the students could not draw it correctly.

xi) Unit test 5(page 20). This was an interesting unit and 40% to 60% of the students had done it well.

5.4. Part-III-Unit A-3.

A- Errors Found in Workbook.

In Unit test (Page 19)A,B & C are not printed in the original booklet.

B- Difficulties in teaching, adaptation and supply of teaching aids.

i) Teacher's guidance is very much needed for teaching this Unit.

ii) A kit of blocks is needed for teaching the concepts.

iii) Cardboard cartons are required for explanation and making the concept clean.

iv) A set of blocks of wood of various shapes and sizes are required for teaching effectively.

v) Self Test (page-11) is alright.

vi) Unit Test(page-18) should be easier than given in the workbook. Most of the students were not able to do it correctly.

vii) More easier exercises should be incorporated in the workbook so that it may become self-explanatory.

viii)Unit A'3 is harder and more difficult than Unit A 4 which follows.

C. Suggestions for Improvement.

Page No.	Exercise No.	Suggestions.
1-4	-	Information given on page 1-4 is very useful for students in the development of the concept. Blocks of wood are required to explain the concept of front view, side view and top view.
5-6	1-5	These exercises are useful and are in sequence.
7	1-3	Ex.1-3 are done well by most of the students.
8	6-8	These are in sequence and are generally understood by the students and drawn correctly.
9	9-11	These are in sequence and were found useful.
10	4-8	These exercises are alright and were done fairly well by most of the students.
11	Self Test 1-3	Self Tests 1-3 were found useful.

12	12	This exercise was found slightly difficult and the students could understand it when the teacher explained it on the board. It would be better if blocks are used as model.
12	13-14	The teacher is required to explain these exercises with the use of blocks of wood. Both the exercises were very difficult.
13	15	This exercise is difficult and wooden model is needed to explain it.
13.	16-17	These were found very difficult by majority of the students.
14	Reading Ex. 9-13	These are discriminating exercises. The exercises were found of discriminating value for the students.
15	18-20	These exercises were drawn by the students only when the teacher provided guidance to individual students. Exercise No. 20 was very difficult.

15	21-22	These exercises were taught by the teacher to the whole class. Both the exercises were difficult.
16	23	This exercise was very difficult and only 30% of the students could draw it.
17	Folding ex. 10-13	These exercise were gradually difficult and were found useful.
18	Unit Test 1-2	Unit tests 1 and 2 were found extremely difficult by the students. They may be replaced by easier tests.
19	Unit Test 3	These exercises were found useful.

5.5. PART-IV-Unit A-4.

A. Errors found in Workbook.

i) In Exercise No.1 (Page-18) the solution is 'C' but top view drawn in the figure is incorrect.

B. Difficulties in teaching, adaptation and supply of Teaching aids.

i) Wooden models are necessary for explaining the concepts.

ii) Match boxes should be used for explaining in the classroom. Individual students should also use match boxes for learning.

C. Suggestions for Improvement.

Page	Exercise.	Suggestions.
1	-	It is useful. The objectives are spelled out well.
2.	-	Assembly and part lists shown on the bottom of the page do not seem to be relevant to this Unit.
3 to 5	-	The pictures drawn are self-explanatory and were found useful.
6-7	Drawing 1-4	The exercises are in sequences and were generally done well by the students.
8	Drawing 5-6	A number of other exercises of match boxes may be drawn before exercises 5-and 6 are taken up.
9	Drawing 7-8	It is very important to use models of match boxes or blocks of wood before the students are required to draw these exercises. Ex.8 should precede Ex.7.

Drawing Reading 3	Ex. 3 is not correct as the diagram is not drawn properly.
Self Test 1	It was found extremely difficult for the students. It should be replaced.
Self Test 2	For this exercise instructions may be modified.
Drawing 9-10	This exercise is alright but the relevance of exercise 10 is not understood.
Drawing 11-12	Ex. 11 is alright but the relevance of Ex. 12 is not understood.
Drawing 13	Ex. 13 is a good exercise and was done well by majority of students.
Drawing 14	The top view may be included in this exercise so as to make it better understood by the students.
Drawing 15-16	These exercises are alright.
Drawing Reading 13	Front view given in 'A' (answer) is not correct as the top is divided into two.

16	Drawing Reading 14-17	These exercises are useful.
16	Drawing Reading 13	The answer is 'G' but the front view and side view are not correctly printed in the workbook.
17	Unit Test 1-2	Most of the students did well in these test exercises.
18	Unit Test 1-6	Exercises 2-6 are alright. In Ex.1, the solution is 'C' but the top view is not drawn correctly.
General Suggestions:		Unit A-4 should precede Unit A-3 because the concepts of Unit A-4 are easier to learn than the concepts of Unit A-3. This is suggested according to the principle of following, the maxim, 'easy to difficult'.

5.6 PART V (Unit A-5)

A. Errors Found in Workbook.

i) At page 10, in the exercises 4-6 the dimensions given in the main figure should be 40mm instead of 45mm.

ii) At page 16, in the exercises 11-12 the dimensions is 51mm instead of 50mm.

iii) At page 17, in the exercise 7, the dimension is 4mm instead of 5mm.

b. Difficulties in teaching, adaptation and supply of Teaching Aids.

i) Photostat copies prepared in India for the students Workbook did not give correct dimensions as the size of the diagram was altered in the photostat process.

C. Suggestions for Improvement

Page	Exercise	Suggestions
1	Introduction	The objectives are clearly mentioned and are achievable.

2-6	Introduction	The drawing exercises are quite clear and were self explanatory.
7	Drawing Reading 1-3	Before the students are able to draw arrow marks on the drawings, they should be given practice in drawing arrows correctly and in proper size.
8	Dimensioning 1-2	These exercises were found useful.
9	Dimensioning 3-4	These are alright.
10	Dimensioning 4-6	The students may be explained the following three principles in respect of giving dimensions to the figure: a) Dimension line should never touch the object in a figure. b) Dimension lines and rough work should be done by 2H or 3H pencil.

		c) Maximum dimensions should be given in the main diagram. Exercises 4-6 were done well by most of the students.
11-13	Dimensioning 1-8	Pages 11 to 13 are useful in the growth of the learning of the students.
14	Self Test 1-8	The exercises were found useful.
15-17	Self Test 9-12	The exercises were found quite useful.
18-19	Dimensioning 13-15	These exercises are very good and useful. Majority of the students have done it with pleasure.
20	Drawing Reading 1-7	The exercises were slightly difficult for average students. Easier exercises should precede these exercises.
21	Unit Test 1-2	Very useful and discriminating.

PART VI - UNIT A 6

A - Errors Found in Workbook

NIL

B - Difficulties in Teaching, Adaptation and Supply of teaching aids

Teaching Map Scale in class VIII was quite a difficult exercise. It required lot of time to explain the use of the scale. In adaptation of the Students Workbook, lot of work was done so as to make this unit worthy of the students of India. This required running about and meeting people of Tourist Department, Municipal Board, Urban Improvement Trust and architects. Similarly, teaching aids were collected from the above mentioned sources. This could be done better if the students are taken to a centre where draftsmen or architects work.

C. Suggestions for Improvement:

Page	Exercises	Suggestions
1	Introduction	The objectives No.3 and 4 were found difficult even by providing assistance. It seems that the students of class VIII are not

		mature enough to draw maps and plans of city school or class-room.
2-4	Introduction	The maps were replaced by local maps of Ajmer city and nearby places. It would have been better if full size maps instead of small size maps are provided on each page in the introduction.
5-7	Introduction	These drawings were found extremely useful.
8-10	Drawing Reading 1,3 & 5	The route should be traced not only with red pencil but a number of coloured pencils are needed to avoid duplication of lines.
11	Drawing Reading 7-8	Exercises No.7 was replaced by map of Delhi. The questions given are useful. It is suggested that the map should be of full size rather than 1/4th of the page.

12-13	Drawing Reading 9-12	It is stressed that the map on exercise 9 and 11 should be of full size. Questions are useful.
14-15	Self test 1-4	Ex. 1-3 Maps were replaced but it wouldhave been better if full page size maps were used.
16	Drawing Reading 13	Full page size map of Ajmer city was provided in the work book prepared in India. Questions given are alright.
17	Drawing Reading 14	Exercise is alright.
17-18	Drawing Reading 15 & 17	These exercises are quite hard for the students. The students of class VIII are not mature enough to draw the map of their town or village or of their school building. In place of these exercises maps of local city or town and of the school building should be provided. This should be of full page size. It is difficult

	for the students to calculate the scale of the plan.
Drawing Reading 19	This exercise was found difficult for Indian students.
Drawing Reading 20	This exercise was very interesting and lively. The students took keen interest in completing this work.
-	Instead of cutting the workbook the students were provided cut-outs in different colours for classroom furniture, bed-room dining table, etc. This was convenient and worked well.
Drawing Reading 21	This was a very useful and interesting exercise. This also provided opportunity to the students to be imaginative in planning the setting of furniture of living room and bed room.

23	Unit Test 1	The map was replaced by a local map. The questions were alright. It is suggested that the map should be of full page size instead of 1/4th of the page.
23	Unit Test 2	Calculation of the scale of plan was found difficult by more than 50% of the students.
24	Unit Test 3	Question No.2 was found very difficult and the teacher had to explain it. Question No.3 was not done well by more than 60% of the class students.

CHAPTER 6

CONCLUSIONS

The following conclusions are drawn on the basis of the analysis of students workbook, experience of the teacher in the classroom and observation by the chief investigator.

C.1. The students of class VIII developed greater interest in the course of graphic communications as learning progressed from Unit A1 to A6.

6.2. The teacher involved in teaching and guiding the students gradually picked up more interest in teaching the course of graphic communications to the class.

6.3. The students developed greater confidence in doing work on their own as the course progressed from Unit A1 to A6.

6.4. The group leaders developed greater sense of responsibility and assisted the teacher in maintaining classroom learning environment which is not so congenial in usual drawing classes.

6.5. No material was spoilt or stolen or taken away by the students(This is an achievement of significance because students are prone to taking

6.6. The students learned to draw correctly as they learned that for each error one point would be deducted.

6.7. The students learned to be neat as points were deducted for every unevenness of line, letters, numbers, arrows, etc.

6.8. As time was noted for each of the Unit exercises, the students learned to draw faster than before keeping in view the value of time. Thus time sense was developed among the students.

6.9. The students learned to be more practically imaginative because they were provided release exercises in the workbook.

6.10. The students developed wider interests in technical drawing and reading road maps and railway maps.

6.11. The students gained confidence in learning on their own (self- learning) through the use of workbooks devised for graphic communications.

CHAPTER 7

SUGGESTIONS FOR FUTURE

7.1. Motivation of students is not possible as visualised in the workbooks. The teacher has to provide motivation to the students, at least in the Indian context.

7.2. Materials for drawing should be available with each student when the course is taken up.

7.3. All work in regard to the Graphic Communications should be done in classroom. Home work should neither be given nor expected from the students.

7.4. Students workbook is definitely useful in the process of learning as it generated a sense of healthy competition amongst the students.

7.5. Teacher has to be fully trained in the content of Graphic Communications course. He has to explain the efficacy of each unit to the students beside assisting and guiding them at difficult junctures.

7.6. Use of cardboard cartons and wooden blocks are needed by the teacher in order to make

the students understand the isometric and orthographic drawings.

7.7. It is excellent system to make use of student tutor for making corrections in the workbook and also for guiding the weak students.

7.8. The progress plotter provided in each of the workbooks (at the end) should be used and students may be encouraged to write down what they think about the exercises and their own drawing work.

7.9. Immediate feedback in the form of 'well done', 'doing better ' and 'very good' given by the teacher after seeing the drawing work of the students, was found significantly useful in motivating the students.

7.10. Learning becomes effective if the student is given on the spot guidance and encouragement. The teacher's remark pointing out the accomplishments of the student in drawing and comprehending the exercises should be extensively used to accelerate the progress of the student in the graphic course.

7.11. For effective learning of the course, a kit containing wooden blocks of various dimensions should be got prepared and given to each student. This is useful as a supplement to the students' workbook in learning graphic communications.

7.12. More of graphics games may be devised to make the course lively and interesting to the students. Some games are suggested in the teacher's guide which were found significantly useful.

7.13. The class should be divided into four or five groups in such a way that each group comprise good, fair and average learners. Group loyalty may be developed and the high achievers shouldbe encouraged to assist the low achievers. Groups may be awarded prizes on the basis of their performance in each of the six students' workbook or at the end of the Course.

The procedure of evaluation based on correctness, neatness and time(provided in Teacher's Guide of Unesco) proved useful. Some exercises done by the students should be evaluated by the teacher publicly so that the students may be able to understand the points which need to be emphasised in the course.

ANNEXURE

A	List of Organisation and Persons Involved.
B	Concluding Function
C	Book References
D	Names of Students and Group Leaders.
E	Photographs of Students Working.
F	Questionnaire on Graphic Communications Course.
G	List of Visual Materials Used.

ANNEXURE-A

LIST OF ORGANISATIONS AND PERSONS INVOLVED

A. ORGANISATIONS INVOLVED:

(a) National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi, India.

(b) Regional College of Education, Ajmer, Rajasthan State, INDIA (NCERT).

(c) Demonstration Multipurpose Higher Secondary School, Regional College of Education, Ajmer.

(d) Government Jawahar Higher Secondary School, AJMER.

(e) Urban Improvement Trust, AJMER.

(f) Department of Teaching Aids, NCERT, 10-B, Ring Road, I.P.Estate, New Delhi.

B. PERSONS INVOLVED:

(a) Shri V.K.Pandit, Secretary, NCERT, New Delhi.

(b) Dr.S.N.Dutta, Principal, Regional College of Education, Ajmer.

(c) Dr.Tej Bahadur Mathur, Reader in Education, Regional College of Education, Ajmer.

(d) Shri L.J.Dhawan, Headmaster, Demonstration Multipurpose Higher Secondary School, Regional College of Education, Ajmer.

(e) Shri M.D.Sharma, Senior Teacher, DMPHSS, R.C.E. Ajmer.

(f) Shri M.P.Kaushik,Headmaster,Government Jawahar Higher Secondary School,Ajmer.

(g) Shri Mohan Singh,Assistant Teacher,Government Jawahar Higher Secondary School,AJMER.

(h) Shri Vishal Mathur,Assistant Engineer,Research and Development Section,Toshniwal Industries Private Ltd. Makhupura,Ajmer.

(i) Shri Surajaram Verma, B.Ed.student.

(j) Shri Hardev Singh Man, B.Ed.student.

(k) Shri Daya Shanker,Office Assistant, RCE Ajmer.

(l) Prof.M.M.Chaudhary,Head and Professor, Department of Teaching Aids,NCERT, 10-B Ring Road, IP Estate,New Delhi, INDIA.

(m) Shri Vishwa Mohan Dutta, District Education Officer,DEO Office, Topdara,Ajmer.

ANNEXURE-B

CONCLUDING FUNCTION

A valedictory function of the Unesco's Graphic Communications Course was organised on 11.11.82 at 11.15 A.M. in the Library Hall of Government Jawahar Higher Secondary School, Ajmer. The function was attended by forty two students of class VIII-B and most of the teachers of the aforesaid school. Dr. S.N. Dutta, Principal, Regional College of Education presided over the function while Shri Vishwa Mohan Dutta, District Education Officer, Ajmer was the Chief Guest, Shri D.S. Naruka, Public Relations Officer of Ajmer district was the special invitee. Shri M.P. Kaushik, Headmaster, Dr. Tej Bahadur Mathur, Chief Investigator and Shri Mohan Singh, Teacher Associated with the Graphic Communications Course, were present.

At the outset the invitees were provded an opportunity to see the drawing work done on the six students workbooks by each of the 42 students who were associated with the course. The valedictory programme commenced at 11.30 A.M. Dr. Tej Bahadur Mathur, Chief Investigator. gave a brief account of the Unesco's programme of teaching Graphic Communications

to students. The highlights of the programme of teaching the course to the students of class VIII-B were explained. A report on the observation of the drawing and sketching work was also presented by him. It was also mentioned that on ten Sundays the students had come for the Graphic Communications Course and that they developed keener interest in the course content which was considered interesting and meaningful by them. Another achievement of the students was that they learnt to do sketching or drawing exercises faster keeping in view the value of time.

Shri Vishwa Mohan Dutta, District Education Officer, Ajmer expressed his delight on the achievements of the students. He advised them to keep up the interest in drawing and sketching which he considered would be helpful to them in future life.

Dr. S.N.Dutta, Principal, Regional College of Education, Ajmer congratulated the students on completing the six units of the students workbooks. He thanked Unesco for giving this opportunity to Ajmer students for working and trying out the efficiacy of the Workbooks. At the end, Shri M.P.Kaushik, Headmaster, Govt.Jawahar Higher Secondary School, Ajmer gave

blessings to the students who participated in the work. Special thanks were given to Shri Mohan Singh, Teacher associated with the project and Dr. Tej Bahadur Mathur, Research Investigator for selecting the school for the course on Graphic Communications. Thanks were also offered to all the persons who were present on the occasion.

ANNEXURE - C

BOOK REFERENCES

1. Faure, Edgar et. al - Learning To Be- The World of Education Today and Tomorrow, Unesco Paris 1972 and Sterling Publishers Ltd. 1973.

2. Higgins, Arthur Lovat - Elementary-Surveying. LONGMANS Britain (1962).

3. Jain, Purshottam - Economic Geography of the World (In Hindi Language). Rastogi & Company, Meerut (1965).

4. Kumar, Sushil - Building Contruction. Standard Book Depot Delhi (1965).

5. Lakshminarayanan V. and Mathur, M.L. - A Textbook of MACHINE DRAWING. Jain Brothers, New Delhi-5

6. SARAO, A.S. et al - Elements of Mechanical Engineering and Workshop Technology. Tech. India Publications Delhi (1966).

7. Wilson, Frank W. - Fundamentals of Tool Design. Prentice Hall of India (Pvt.) Ltd., New Delhi-1964

8. Unesco Publication - Graphic Communications, Info TVE-6, Background Paper, Section of Technical and Vocational Education, 7 Place de Fontenoy, 75700 Paris (1979)

9. Unesco Publication - Graphic Communications, Teacher's Guide, Section of Technical and Vocational Education, 7 Place de Fontenoy, 75700 Paris (1979).

10. Unesco Publication - Graphic Communications, A Proposed Technical Drawing Course for General Education, Students Workbooks (UNIT A1 to A6; UNIT B1 to B6 and UNIT C1 to C6), 7 Place de Fontenoy, 75700 Paris.

ANNEXURE - D

Names of Students and Group Leaders

Name of the School: Govt. Jawahar Higher Secondary School, Ajmer.

Class: VIII - B

Total No. of students: 42

CLASS MONITOR : SURESH KUMAR SHARMA

GROUP - A (RED COLOUR)

1. Vishnu Dutt Sain (Leader)
2. Suresh Kumar Sharma
3. Sampat Sain
4. Dungar Singh
5. Jitendra Jain
6. Lokesh Indora
7. Hitesh Tak
8. Ratan Puri
9. Ramesh Chandra
10. Mahendra Tak
11. Abdul Razaak

GROUP - B (GREEN COLOUR)

1. Rajesh Kumar (Leader)
2. Vishnu Kant

3. Shyam Sunder
4. Vivek Saxena
5. Sanjay Kumar Pandey
6. Vinod Kumar
7. Rajesh Dhadich
8. Ajit II
9. Mahipal Singh
10. Badruddin
11. Nand Singh
12. Neeraj Srivastava

GROUP - C (BLUE COLOUR)

1. Kailash Chand Mali (Leader)
2. Rajveer
3. Mohammad Akram
4. Raju Sankhla
5. Ramjan Ali
6. Gajendra Sharma
7. Shanker
8. Dayal Singh
9. Dharam Raj
10. Ramesh Chand Sindal

GROUP - D (YELLOW COLOUR)

1. Ajit Kumar Sharma (Leader)
2. Rajendra Singh
3. Tej Karan
4. Lakshmi Narayan
5. Rajesh
6. Virendra Singh Rathore
7. Om Prakash Tak
8. Lakshman Singh
9. Lokesh Chauhan

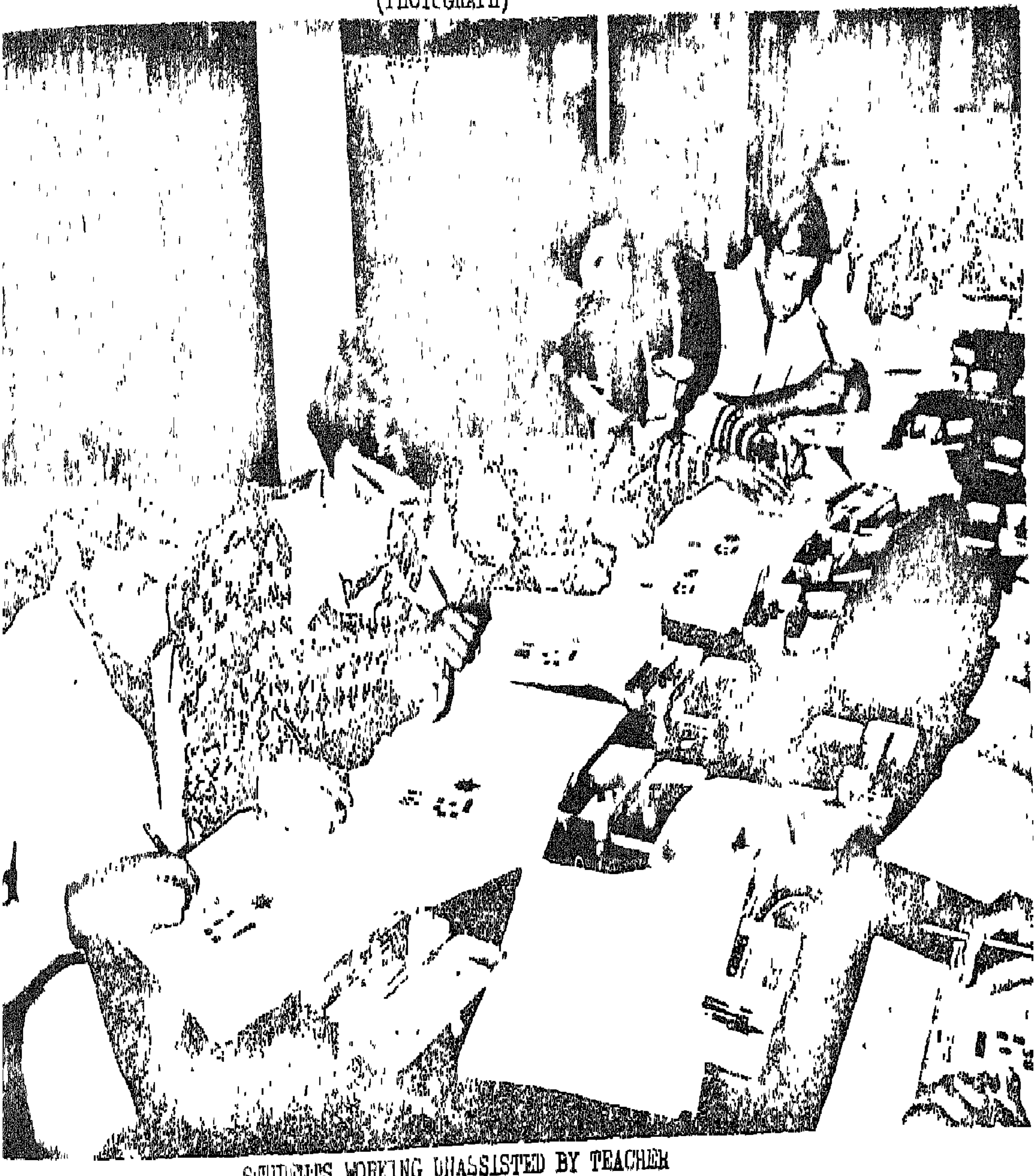
ANNEXURE - E (i)

(PHOTOGRAPH)

STUDENTS ABSORBED IN INDIVIDUAL WORK

ANNEXURE - E (iii)

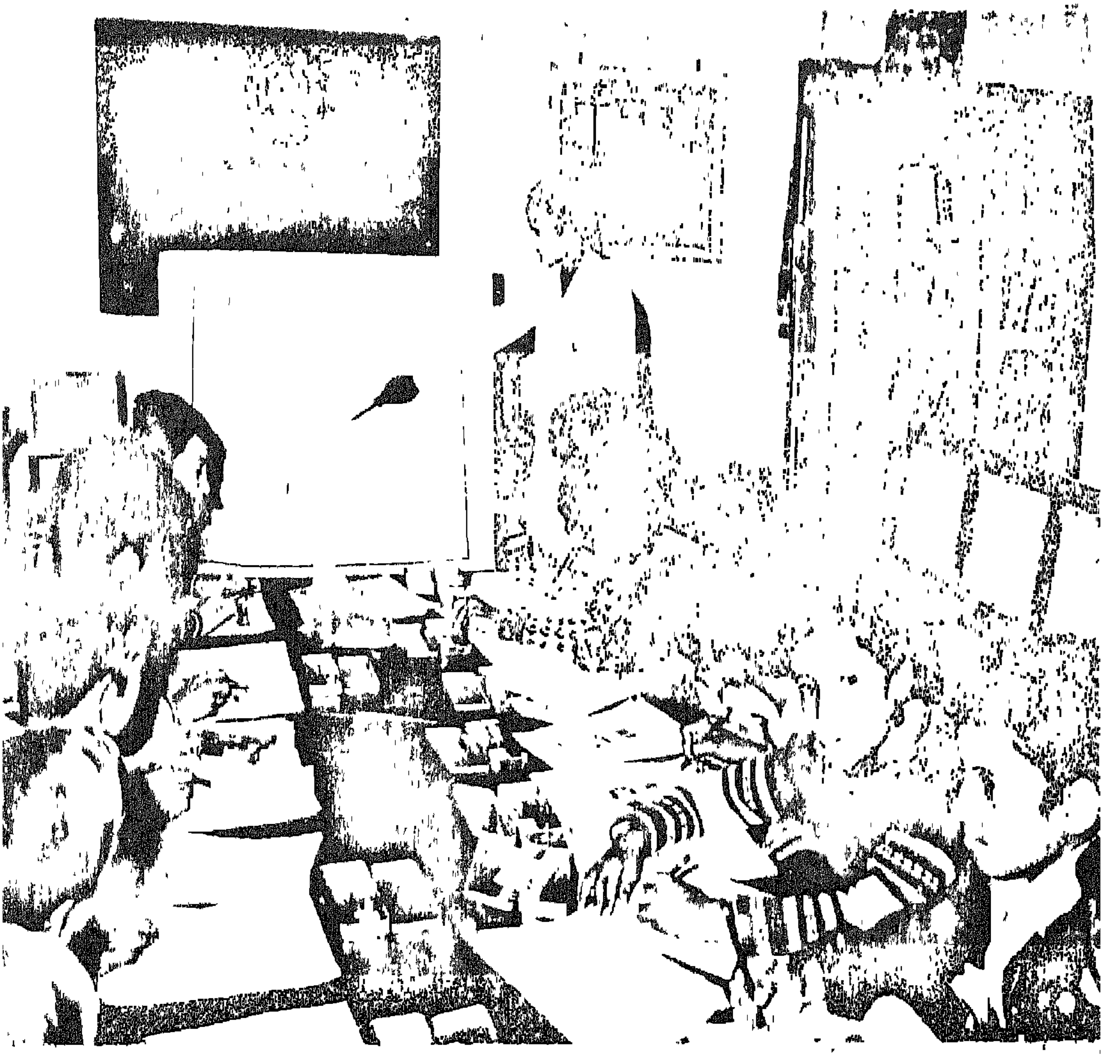
(PHOTOGRAPH)



STUDENTS WORKING UNASSISTED BY TEACHER

ANNEXURE - E (iii)

(PHOTOGRAPH)



TEACHER EXPLAINING MAP READING TECHNIQUES

TO STUDENTS

ANNEXURE - F

QUESTIONNAIRE

ON

GRAPHIC COMMUNICATION COURSE

Name of Evaluator : Dr. TEJ BAHADUR MATHUR & Mr.MOHAN SINGH

Country India Please describe the conditions of the experiment:

Language : Hindi No. of schools - One

Level Grade 8 (VIII) No.of pupils 42 No. of courses A1 to A6 Sex: Boys Average Age 14 Location AJMER .

Additional Information : The course was accepted by the boys. The motivation of boys increased as the course proceeded from Unit A1 to Unit A6.

1. Have all six units been completed within one regular school year, Yes ✓ No_____

2. To what extent have the objectives of each of the six A units have been achieved

	Poor	Good	Excellent
Unit A1			✓
Unit A2			
Unit A3			
Unit A4			
Unit A5			
Unit A6			

3. What specific changes in the units would you propose based on your experience, Please attach your proposal (See Chapter 5 of the Report)

4. Did you have difficulties in:

	Yes	No
Translation	✓	
Adaptation	✓	
Reproduction (printing)	✓	
Distribution		✓
Experimentation		✓
Provision of learning resources, e.g. boards, instruments		✓
Incorporating the course into the existing curriculum		✓
Provision of effective and motivated teaching staff		✓

5. Describe other subjectsthat you consider of interest on the evaluation of the course:

See Chapter 6 of the Report.

ANNEXURE - G

LIST OF VISUAL MATERIAL USED

Unit A-1 Charts

1. Instructions for Drawing Work.
2. Evaluation of Drawing Work.
3. Exercise No.8 on chart
4. Numbers written on chart (Exercise 13)
5. Use of Triangles.
6. Use of Set Squares.

Models

1. Drawing Board & T Set
2. Teachers' Instrument Box.

Unit A-2 Charts

7. Basic sketching technique
8. Simple Design (Ex . No.11)
9. Design of Aeroplace (Ex . No.12)
10. Design of a Hut (Ex .No.12)
11. Instruments for use in Cycle Repair
12. Match Box in different views.
13. Progress in sketching

Models

3. Modelsof Match Boxes - 10 pieces
4. Wooden blocks - Two

6. Table - Two

7. Waste paper basket - One

Unit A-3 Charts

14. Top view, Side view and Front view (Introduction)

15. Learning kit (Page 4)

16. View of a Block cut (Page 5)

17. Top view of a Block (Page 6)

18. Another top view of a block (Page 6)

19. Block Design with three views (Ex No.18)

20. Block Design with three views (Ex.No.19)

21. Design Block of Exercise No.20,

22. Design Block of Exercise No.21

Models

8. Wooden Blocks - One set

9. Cardboard cartons - 15.

Unit A-4 Charts

23. Three views of a Block (Page 2)

24. Block of Wood Model

25. Picture of a House (Page 2)

26. Match Box placed on another Match Box (Ex.6)

27. Match Box standing on another Match Box (Ex.5)

28. Block design in two shapes

29. Unesco Project - Class VIII-B (Names of Leaders)

30. Design of a Chair

31. Design of a Tumbler

32. Design of a Box

33. Design of a PATTA

Models

10. Wooden Blocks - One set

11. Wooden PATTA - One

12. Wooden Box - One

13. Table - One

Unit A-5 Charts

34. Match Box drawing dimension (Page 2)

35. Rules of dimensioning (Page 4)

36. Chart showing dimensions (Page 4)

37. Dimensions - Correct and Incorrect

38. Dimensions of 10,15,20,25 and 30.

39. Three views of Dimensions

40. Write Dimensions in figure

41. Noting Dimension in figure (Page 17)

42. Dimensioning in Ex.13 (Page 18)

43. Dimensioning in Ex.14 (Page 19)

Models

14. Picture Blocks - 12 Pieces

Models

14. Picture Blocks - 12 pieces

15. Wooden Blocks - Ten

Unit A-6 Charts

44. Map of Rajasthan (Tourists)

45. Map of Ajmer (Blue map)

46. Map of Delhi

47. Map of school building

48. Small size map of Ajmer Roads

49. Road map of India

50. Railway Map showing Ajmer and Rajasthan State.

51. Railway Map showing Delhi

Models:

NIL